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Linking theory and practice: teacher research in history and geography classrooms

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ABSTRACT

The impact of scholarly research in education on the educational practice in secondary school is low. Academics examine problems that teachers in school perceive as irrelevant, want to publish in peer-reviewed journals instead of disseminate their work, and aim at generalizing insights rather than improving school practice. Teacher research might be a way to link educational academic research and teaching practice aiming at furthering professionalism in teaching, improving teaching practice and extending the knowledge base on teaching and learning. Four experienced secondary school teachers systematically investigated their classes, guided by a supervisor. Their materials as well as formal and informal communication with their supervisor and with each other were analysed. Related to their research projects, these teachers reported significant changes in their understanding of student learning and their teaching. They took different perspectives on teaching, looked at alternative solutions for problems, and reflected more deeply on their own teaching as well as teaching of their colleagues. Although each of them published an article in a peer-reviewed journal, they reported difficulties with extending the knowledge base on teaching and learning. Not only did they rarely share results with their colleagues in school because they were perceived as external researchers, they also struggled with writing journal articles and coping with peer reviews. We discuss the value of situated generalization as one of the implications and discuss how teacher research could lead to a new in-between research practice, linking theory and practice, and researchers and teachers.

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Teacher research; classroom research; theory–practice relationship; participatory research

Introduction

Teaching in secondary education is mostly grounded in the practical wisdom of teachers (see Schwartz and Sharpe 2010). Teachers generally seems to have limited knowledge of, access to, and interest in insights from educational academic research (cf. Beycioglu, Ozer, and Ogurlu 2010; Gore and Gitlin 2004), even in settings that are assumed to provide a research-engaged environment for teachers such as professional development schools

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(Vrijnsen-de Corte et al. 2013). Yet the impact of academic research on teaching practice seems to be disappointingly low. Debates, literature studies, as well as empirical work on this gap between educational academic research and educational practice suggest that scholars examine problems that teachers in school perceive as irrelevant, want to publish in peer-reviewed journals instead of disseminate their work, and aim at generalization of insights rather than improving school practice (cf. Broekkamp and van Hout-Wolters 2007; Burkhardt and Schoenfeld 2003; Vanderlinde and van Braak 2010). Teacher research on teaching and learning might be a way to link academic research and practice. Teachers might not only understand and redesign their practices by monitoring and evaluating teaching practices, but also develop their professional skills such as a critical reflection on their own practice as well as on the practice of their colleagues. Of equal importance, teacher research can be a valuable way to use insights from the knowledge base on teaching and learning as well as to add new insights into it (cf. Admiraal, Smit, and Zwart 2014; Thomas 2012). The objective of this study is to show how teacher research on teaching and learning not only supports teachers' professional development and their understanding of teaching practice, but also offers possibilities to add insights from that research to the knowledge base on teaching and learning.

Gap between educational academic research and practice

The impact of educational academic research on educational practice in secondary schools is low. Teachers tend to resent researchers for examining questions that are not the concern of practitioners. Conversely, academics tend to criticize teachers for not using the best and most up-to-date knowledge from research to understand schooling and make everyday decisions in class (Broekkamp and van Hout-Wolters 2007; Burkhardt and Schoenfeld 2003; Vanderlinde and van Braak 2010). Gore and Gitlin (2004) argue that these tensions between academics and teachers are related to the long tradition of framing educational research in a way in which teachers are positioned primarily as 'users' rather than 'producers' of knowledge and whereby the knowledge teachers produce is experiential knowledge and not valued (outside schools) in the same way as knowledge produced by academics.

Based on a literature review, Broekkamp and van Hout-Wolters (2007) identify four interrelated problems that mark this gap between educational academic research and practice:

(1) Educational research does not provide valid and reliable results that are confirmed through unambiguous and powerful evidence.
(2) Educational research is limited in practical use.
(3) Educational research is not meaningful for teachers.
(4) Teachers make little (appropriate) use of educational research.

These findings are confirmed in a large body of literature, of which a few studies empirically investigate how teachers value academic educational research. On the basis of focus-group interviews with different stakeholders of academic educational research, Vanderlinde and van Braak (2010) showed that the gap between research and practice was acknowledged by all participants (teachers, school leaders, intermediaries, and researchers). Teachers were sceptical about the value of educational academic research and argued that educational researchers do not ask questions of practical relevance. Descriptive research was not seen as useful by both teachers and school leaders. Yet they expressed an appreciation for

design-based research or research that leads to practical applications. Researchers stated that they mainly disseminate their results through publications in practitioner journals. However, these journals appeared to be not well known by school leaders and even unknown by teachers. The authors conclude that a supportive context in which to disseminate findings from academic research to practitioners is absent.

The afore-mentioned conclusions are confirmed by the questionnaire study of Gore and Gitlin (2004). These authors showed that while teachers see academic research as the dominant form of educational research, they do not value this form of research, particularly as they become more experienced as teachers. All groups that participated in the study expressed concerns about the practicality, contextuality, credibility, and accessibility of academic research. An earlier-dated questionnaire study by Everton, Galton, and Pell (2000) showed a less negative picture: almost all teachers mentioned that they seriously considered educational research findings since first qualifying as teachers. Moreover, these teachers generally valued educational academic research when it focused on classroom actions, tackled specific teaching approaches, or demonstrated effective learning. It was less valued for the capacity to enable teachers to design their own research and support them to interpret research findings for their own benefit.

Teacher research

Proposals on how to bridge this gap between academic research and practice concentrate on the need to build better lines of communication between researchers and practitioners, and encourage practitioners to get more involved in the research process. Vanderlinde and van Braak (2010) concluded that schools should create more opportunities for practitioners and researchers to collaborate, disseminate findings, co-construct ideas, and set research agendas. Cordingley (2008) argued that researchers should be encouraged to open up their research for practitioners, teachers should be encouraged to connect more with research texts, and intermediaries are needed to bridge the worlds of academics and practitioners. But these proposals are not new and in many instances interaction and communication between researchers and teachers are still problematic and both teachers and researchers stick to their 'traditional' roles of knowledge user and knowledge producer, respectively (see Schenke 2015).

Another way to close this gap between research and practice in secondary education might be research by teachers. Obviously, research by teachers solves the problem of academic research being irrelevant for teachers and educational practice. Two decades ago, Kaestle (1993) already argued that researchers could link research and practice by involving practitioners in the design and implementation of research and that research training should be incorporated into the initial preparation of teachers and administrators. However, Gore and Gitlin (2004) reported that the teacher in their study told them very clearly that research produced by academics remained the dominant educational research discourse while 'teacher research' was an alternate (and largely marginalized) form of educational research. One of the reasons for this could be that teacher research is more focused on practical relevance and less on generating knowledge about teaching and learning via, for example, academic publications.

Teacher research is made up of a loose collection of programmes, projects, networks, communities, and partnerships and takes various forms (Cochran-Smith and Lytle 2009).

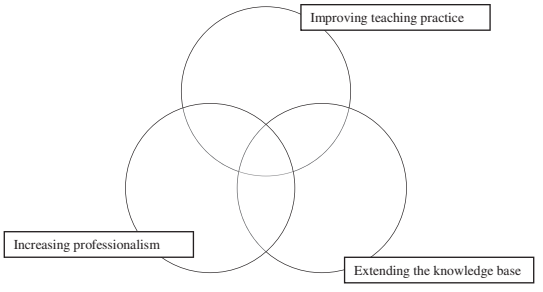

Figure 1. Three aims of teacher research.

Although definitions vary, teacher research is based on data which have been systematically collected and analysed for a clearly defined purpose. The commonality seems to be that teacher research is focused on the improvement of teaching practice.

Literature reviews and meta-analyses of teacher research (for example, Anderson and Shattuck 2012; Davis, Kiely, and Askham 2009; Tan, Macdonald, and Rossi 2009; Zwart, Smit, and Admiraal 2015) conclude that, in general, teacher research tends to include small-scale, qualitative research aimed at describing, understanding, and evaluating teachers' own teaching; Hardly any claims are formulated about similar practices in a broader context. Moreover, these reviews show that most teacher research consists of evaluation of teaching on the basis of perceptions of teachers and students, with conclusions about and implications for the practice of the particular teacher doing the research. Teacher research that consists of quantitative or mixed-method studies using pre-test–post-test control group designs and test scores to deduce conclusions about effects of teaching interventions is rare. Finally, teacher research is rarely aimed at generating knowledge about teaching and learning by generalizing to other populations, places, and points in time on the basis of statistics or valid qualitative argumentation. Instead it is mostly focused on maximizing content or depth, which also can be understood as a quality criterion of educational research (Swanborn 1996).

Problem of this study

The impact of educational academic research on teaching practices in schools is limited. The traditional ideas about the knowledge chain in education, from knowledge via dissemination to practice, seem not be valid anymore and teacher research on teaching in secondary education might offer the possibility to increase the impact of research on teaching. Types of teacher such as action research, self-study, lesson study, and practitioner inquiry aim at increasing teachers' professionalism or understanding and improving educational practice or both. However, research by teachers seems to be seldom aimed at generating knowledge about teaching and learning, which is shared with the research community. In the current study, four secondary school teachers examined their classrooms, in collaboration with a university professor. Three research questions guided this study:

(1) How can teacher research further their professionalism in teaching?
(2) How can teacher research improve teaching practices?
(3) How can teachers research extend the knowledge base on teaching and learning?

The combined answers on the three research questions will provide insights into how valuable teacher research can be to address the three aims of increasing professionalism, improving teaching practices and extending the knowledge about teaching and learning simultaneously, which is the area in the centre of Figure 1.

Methods

Context

The context of this study is a two-year half-time Master of Science programme for secondary school teachers with more than two years of teaching experience. Scholarly research in teaching practice was a main theme throughout the curriculum. Based on implications mentioned in the literature on professional development of teachers (for example, Sales, Traver, and Garcia 2011), four design principles were applied in the pedagogy of this master's programme.

First, the research projects in this master's programme were closely connected to the daily teaching practices of the teacher-researcher. In this way, teacher research aligns with the practical wisdom of teachers about teaching, motivates teachers and their colleagues because of its practical relevance and authenticity, and increases teachers' autonomy in teaching. Educational research about teaching and learning in secondary education in general and about topics at school and (national) policy levels includes research activities for which a teacher role seems to be less relevant.

A second design principle took account of learning from experience or learning by doing. In the master's programme, teachers learnt to develop their research skills by carrying out a research project and being fully responsible for the entire process from the set-up of the research project to submission to a journal.

The third design principle included the application of an apprenticeship model: teachers learnt and worked not only together with other teachers, but also together with and under supervision of expert researchers. They (teacher and supervisor) co-authored the publication of the master's thesis when it was submitted to a journal.

Fourthly, collaborative learning (peer feedback, peer assessment, inter-collegial support) was an important part of the pedagogy of the master's programme. Collaborative research projects were stimulated, but whether teachers collaboratively examined their teacher practice or not was up to them. Of the three research projects which are summarized in the Results section, two were individual projects and one was a collaborative project of two teachers.

Participants

Four experienced secondary school teachers (one female, three males) participated. They had more than five years of teaching experience in secondary schools and at the time of the current study they taught in pre-university education (Kathy and Roger) or in both pre-university education and senior general secondary education (Ulf and Howard). In the Netherlands, there are three school levels of secondary education, starting at student age 12:

(1) Pre-vocational secondary education is preparation for a practical internship followed by work or a continuing vocational education. This generally takes four years, depending on the subjects chosen.

(2) Senior general secondary education takes five years and prepares for universities of applied sciences.
(3) Pre-university education takes six years and is the admission level for research universities.

In the school year 2010/11, the participants carried out a research project, guided by a university professor. The participants gave their full consent for their participation in the current study. The four participants and their supervisor are shortly introduced in the following.

Kathy

Kathy[1] was a secondary school history teacher in small town in the eastern part of the Netherlands. After some years of teaching, she looked for a new challenge in her career. During her Master's in History and Teaching in History she carried out historical research and research on teaching the school subject of history, but she also wanted to gain experiences in social science research. Kathy had a clear idea in mind of what she wanted to examine: how to apply class preparation assignments to engage secondary school students in class. Since 2011, she has been teaching classes in addition to taking up the administration of the academic professional development school (i.e. a secondary school that forms a partnership with a university to collaborate in practice-based research and supervision of pre-service teachers). She also became president of a national teacher network that organizes professional development activities and recently joined the advisory board of the National Network for Educational Research in The Hague.

Roger

Roger was a secondary school history teacher in small town near Amsterdam. After some years of teaching, he got a little frustrated that his initiatives to innovate teaching practice in school were not followed up. He thought grounding innovations in teaching in research could make his initiatives more successful. Prior to his research project, Roger carried out some small research projects to develop his research ideas. Since 2011, he had been teaching in secondary education for a short while but moved quite soon after to the Amsterdam University of Applied Sciences to become a history teacher educator.

Ulf

Ulf was a secondary school history teacher in a small town in the eastern part of the Netherlands. He was already involved in supervision of pre-service teachers and wanted to expand his research experience to research methods in the domain of social sciences. Ulf first carried out a Delphi study on how teachers perceived the climate in his school, which was recently reorganized. It was a research project commissioned by the school board. He decided to collaborate with Roger to carry out a research on history teaching. Since 2011, he has been teaching in secondary school.

Howard

Howard was a secondary school geography teacher in a small city in the south-west of the Netherlands. He had a lot of teaching experience in secondary school and would like to learn more about educational theories in order to upgrade and further develop his understanding of teaching and learning. He changed his research ideas from examining student motivation

and how teachers could increase this to investigating a particular innovative instruction method he further developed and used in his practice; that is, teaching geography with mysteries. Since 2011, he has been teaching and successfully acquired a scholarship from the Dutch scientific research foundation to become a PhD candidate.

Uri

Uri was the initiator and one of the supervisors of the professional development programme. He had a background in social psychology, but worked for 20 years in teacher education as teacher and researcher. He set-up so-called research laboratories in which school teachers collaboratively examined their teaching practice.

Data

The data consisted of the following:

(1) Reports of the three research projects of the four participants.
(2) Email communication (question–answer emails about the research projects of the participants and ongoing emails about the submission of the journal articles after the programme had finished).
(3) Logbook supervisor Uri used to monitor – at a general level – the impact of the programme activities, summarizing formal and informal conversations (coffee-break talks, talks at conference breaks) during meetings and conferences. Formal conversations refer to discussion meetings and supervision sessions as part of the master's programme and at conferences.
(4) Learner reports that the four participants completed twice during the period of their research project.

All data sources provided data for answering the three research questions, with the exception of the research reports which were only analysed for answering the third research question. The three research projects – which will be described in the following – were summarized and accounts of both the communication between supervisor and participants and among participants and the learner reports were added to the qualities of the reports of their research projects. The resulting data-set was then split into three subsets of texts: text on the evaluation of parts of the professional development programme the participants attended; text on participants' description and evaluation of designing, implementing, and publishing research projects (including learning to do research which obviously also could have been included in the first subset); and texts with aspects not referring to the programme or research projects, such as difficulties with teaching in school, problems with peers from the programme or colleagues in schools, and announcements and messages of being late. The second subset formed about 30% of the data and was selected for further analysis.

Data analysis

The narrative analysis of this second subset of data included summarizing the subset for each participant for how relevant teacher research was to increasing teachers' professionalism, to improving teaching practice and to extending the knowledge about teaching and learning.

To guard against preset interpretations, the linkages of the three resulting themes and their descriptions of these with the data collected were discussed amongst four experts not involved in the guidance of the four participants until consensus was reached (see Marble 1997).

Increasing teachers' professionalism

Themes that were included in this first type of outcomes refer to, among other things, the role of teacher research in acquiring skills and knowledge of both teaching and doing research, in developing awareness of different perspectives on teaching (teacher, colleagues, school leaders, and students) and research, and in critical reflecting on the design of the study and its outcomes.

Improving teaching practice

This second type of outcomes was indicated by statements about how research helped them to design, evaluate, monitor, and innovate their teaching practice, about the link between their research projects and stakeholders in school (colleagues, students, and school leaders), and about the connection of their research project with developments and innovations in school.

Extending knowledge base about teaching and learning

Outcomes referring to extending the knowledge base on teaching and learning were indicated by text segments dealing with generating insights beyond the local context of their research projects and with sharing their research with the research community and with other teachers by publishing or conference presentations, including reviews of their research projects by journal reviewers, peer researchers, and colleagues.

Results

Before we present the results on each of the three types of outcomes of teacher research, we first summarize participants' research projects. Their research reports have been published in adapted form in peer-reviewed journals (Honing, Claessens, and Admiraal 2012; Buijs and Admiraal 2013; Karkdijk, van der Schee, and Admiraal 2013).

Study on effects of homework assignments on student engagement (Kathy)

Kathy examined her own teaching in two groups of pre-university education students. She studied the effects of four homework assignments on students' engagement in class. In the first assignment (preparation of practicing analytical skills in class), students answered questions at home to identify elements of a propaganda poster. In class, student had to identify the goal and the technique of the poster by applying elements they prepared at home. The second assignment (fragmented assessments) was spread over six lessons. Before each lesson, students studied one-sixth of the material and had the opportunity to take test questions and to ask questions in class, before they completed a test in the final lesson. With the third assignment (jigsaw), students prepared at home different materials on the same complex concept (e.g. National Socialism). In class, they discussed each part in order to obtain an overview of the whole concept and applied their knowledge in a new class assignment.

The fourth homework assignment (student choice) meant that students were allowed to choose their own assignment. All assignments were grouped on topic and difficulty. Students started at home and completed the assignments in class. In all classes, Kathy video-taped student behaviour and activities in order to understand students' engagement with the tasks (time on task, collaboration in groups and the number and variety of questions). Similar data were collected in two classes before the start of the project in order to obtain a baseline of student engagement in each group. Three out of the four assignments (jigsaw, preparing of practicing analytical skills, and fragmented assessments) showed a significant increase in the three indicators of students' engagement, compared with the baseline. The jigsaw assignment showed the largest increase, although students valued this assignment the least. Apparently, the interdependency of students stimulated them to prepare lessons and to be engaged in class activities.

Study on students' historical knowledge (Roger and Ulf)

Roger and Ulf examined students' historical knowledge, each in their own classes and school. They used a pre-test–post-test control group design with four student groups creating, in series of four to six lessons, concept maps about a particular historical concept (intervention condition) and four other groups who were taught in a regular way (control condition). Students in the control condition also applied concept maps for another concept but after the post-test. The pre-test and post-test were knowledge tests with different items from one corpus. Repeated-measures analysis showed that students in the intervention condition (i.e. concept maps) demonstrated a significantly larger increase in historical knowledge compared with the other students. Additional thinking-aloud protocols with four students who completed the concept maps revealed that by creating concept maps students framed the particular concepts in time and context and linked concepts in terms of temporal sequences or causal relationships. The authors concluded that creating concept maps helped students to gain a deeper understanding of historical knowledge.

Study on effects of teaching with mysteries on students' geographical thinking (Howard)

Howard examined not only his own teaching, but also that of six colleagues from different schools in the country (with data from 221 students in total). He was interested in students' geographical thinking skills, which mainly consist of relating environmental, social–cultural, economic, and political phenomena of geography. Howard designed some so-called mysteries and adapted some existing ones. Mysteries are perceived as excellent means to trigger students' understanding and explanation of causes, processes, and consequences (Leat and Nichols 2000, 118). A mystery starts with a challenging question that triggers students to investigate the issue and solve the problem. This challenging question includes information that intuitively seems to be inconsistent with what the students already know. A pre-test–post-test control group design was applied in which some 50% of the students had to solve mysteries in small groups during a series of three or four lessons, and the other 50% were taught about similar topics in a regular way. Both the pre-test and the post-test consisted of three assignments in which students were asked to create concept maps about a new geographical concept. The number of correct relationships in each concept map was used

as an indicator of students' geographical thinking. Students in the intervention condition (i.e. mysteries) generally showed a significantly larger increase in the correct number of relationships, compared with students in the control condition. Thinking-aloud protocols of some student groups in the intervention conditions revealed that during the process of solving the mystery students showed a variety of geographical thinking skills. The author also stressed the importance of student reflection at the end of a lesson with a discussion of the completed mysteries.

Increasing teachers' professionalism

The findings with respect to the first type of outcomes – increasing teachers' professionalism – are summarized in Table 1.

In the learner reports as well as in formal conversations during meetings, the participants explicitly reported significant changes in the way they teach and think about teaching: on the one hand they reported to be more focused on what they want to change in their teaching, and on the other they mentioned that they are more critical and take more different perspectives when they are confronted with problems in teaching. The participants reported that they not only reflected more deeply about the topic they did research on themselves, but also on other topics: they tried to search for literature to base their teaching on, analyse and translate the research outcomes to teaching practice, and evaluate the implementation of new ways of teaching. This increased reflective attitude goes beyond their own teaching. The participants were more aware of the complexity of educational research than before they started their research. This awareness also helped them to critically reflect on educational research carried out by university researchers and policy-makers. Instead of ignoring or recklessly accepting these outcomes, they tried to reflect critically on the research methods and to get a thorough understanding of the results and implications:

> I am also more critical towards the results of some kind of research which is presented in the newspaper, when I read 'research showed that …'. I do not accept the conclusions without first searching for more information about the research itself. Maybe I am less impressed by 'Research shows'. (Part of the second learner report of Howard)

Yet the participants not only reported effects on how they look at their own teaching and teaching practices of their colleagues. In both informal meetings and formal conversations, they also mentioned that they feel more efficacious in the supervision of research of their students. Small research projects are commonly used in the upper grades of secondary education to stimulate higher cognitive learning processes of students and to improve the transition from secondary to higher education. The participants not only reported more knowledge about and skills in research methodology, they also mentioned that they were more equipped to guide students and give them adequate feedback that enables students to perform a small-scale educational research project in a limited time period. Moreover, for Kathy, Ulf and Howard, their feelings of efficacy also referred to the supervision of pre-service teachers, who followed 50% of their initial teacher education programme in their schools. Although this is not guidance of actual research activities, linking practical experiences to theories and empirical literature is an important part of the initial teacher education programme. This experience was especially useful for Ulf who had just started with the supervision of pre-service teachers:

Table 1. Outcomes and challenges related to increasing teachers' professionalism.

Outcomes	Participants reported that:
Reflective attitude	
	• they analysed and reflected on student outcomes and link these to their teaching
	• they took different perspectives in their thinking about teaching and learning
	• they asked questions about research, both inside and outside the school context
Self-confidence	
	• they were more confident than before about their knowledge of research methods
	• they felt more able to supervise their students in their school research projects
	• Kathy, Ulf, and Howard felt more able to mentor student-teachers in their school
Research skills	
	• they were aware of the complexity of educational research
Learning attitude	
	• they understood what it is to be learner (like their students)
	• they were eager to learn new approaches, read literature, search for research
Challenges	
Research skills	
	• they found it hard to formulate research problems and research question
	• they experienced difficulties with generate insights form a local context
	• they had to cope with peer reviews as these were sometimes confronting
Teacher career	
	• Roger developed a career outside school teaching, and Kathy, Howard, and Ulf had other duties in combination with teaching

> I do not have much experience with this. Now I know more about doing research, literature, difficulties with interpreting things, I feel more comfortable and confident, and do not worry too much when I do not know an answer right away. (Quote from the final evaluation meeting at the end of the programme)

However, in the learner reports as well as the email communication with their supervisor, the participants also mentioned challenges which are common for starting researchers such as how to determine and focus the domain and topics to be examined, how to formulate a researchable question, how to select relevant literature, how to deal with peer review, and how to generalize insights with either statistics or valid qualitative argumentation.

Improving teaching practice

The findings with respect to the second type of outcomes – improving teaching practice – are summarized in Table 2.

As mentioned earlier, the participants approached their teaching in a different way by using more and other materials, more literature, and more consultation of their colleagues. In addition, they mentioned that they defined relevant literature for teaching their school subject in a different way: some popular books or articles were replaced or supplemented by a set of articles from scientific journals as the latter provides more evidence. In addition, the participants reported that they read this literature not only because they wanted to use it in practice, but also because they wanted to understand it thoroughly and to develop their professional expertise. In this way, the outcomes of increasing professionalism and of improving teaching practice are seamlessly connected.

The participants, who not only focused their thesis on research on teaching but also carried it out in their own teaching practice, reported in all data sources direct effects on the particular teaching practice which was the object of research. Kathy reported having a more nuanced view on engagement of their students, irrespective of her pedagogy: students who seemed not to be engaged in class were actually on-task, and *vice versa*. She also decided to

Table 2. Outcomes related to improving teaching practice.

Outcomes	Participants reported that:
Understanding practice	• they got more understanding than before of effects of teaching on students
Designing practice	• they used research literature to design teaching and teaching materials
Changing practice	• they redesigned their teaching practice which was examined • they redesigned other teaching practices based on elements of the research carried out

redesign her homework assignments on the basis of the insights from her research. Roger concluded that moderately pre-structured concept maps seem to work the best with this group of students, instead of fully pre-structured concept maps ('fill in the gaps') or totally open concept maps (providing only the concept). Howard further developed mysteries to support students' geographical reasoning and slightly redesigned his pedagogy on the basis of the results of this thesis: more stress on the 'mystical' character, group composition of small groups working on mysteries, and ensuring enough time to plenary reflect on the mysteries in class. The participants did not report serious challenges with connecting their research projects to changing their teaching practices.

Extending the knowledge base on teaching and learning

The findings with respect to the third type of outcomes – extending the knowledge base on teaching and learning – are summarized in Table 3.

The teacher research projects were all three intervention studies. The participants designed, implemented, evaluated, and redesigned interventions in their authentic classroom context. The evaluation of their teaching interventions was directly connected to student outcomes in class, such as students' cognitive learning activities, their efforts, or their performance in class assignments and tests. So, the participants added insights into the knowledge base on teaching and learning mainly by maximizing content and depth of the research results, in addition to statistical significance testing or qualitative inferences. Yet the participants – who published in scholarly journals – mentioned in email communication that they found it difficult to qualitatively generalize about teaching and learning beyond the local teaching or school context they included in their research projects. For example, Kathy mentioned:

> It may be significant, in statistical terms, but it is still about only two classes, in my school, in my History lessons. Now I understand [referring to an earlier email message from her supervisor] that I should do this by providing as much context as possible and argue how this could help other teachers or researchers. But I do not really know how to do this.

The participants also mentioned challenges to writing an article that should be submitted to a scientific journal. They experienced some difficulties with receiving peer reviews and revising their manuscript accordingly. In their view, peer reviews not only asked for major revisions of their work but also emphasized their position as learner, although they understood that peer review is common practice in educational research. In the final evaluation meeting, Howard formulated it like this: 'I am insecure, everything is new, I think I do not know enough, and then you receive the reviews. This really lowered my confidence in publishing an article in the end.' From this quote it is clear that increasing professionalism (*in casu*

Table 3. Outcomes and challenges related to extending the knowledge base on teaching and learning.

Outcomes	Participants reported that:
Generating insights	
	• they maximized content and depth by linking teaching intervention in authentic context to student outcomes in class
Sharing insights	
	• they published in international scientific journals, presented at a research conference, and presented at practitioner meetings • Kathy and Howard shared their research with colleagues, limited within and somewhat more outside school (teacher networks)
Challenges	
Generating insights	
	• Kathy experienced difficulties with generalization from local contexts either by statistics or valid qualitative argumentation.
Sharing insights	
	• Roger and Ulf had some difficulties with sharing their research with colleagues as they did not show much interest in it • they struggled with peer reviews from the journals

becoming educational researchers) and extending the knowledge base (*in casu* publishing a journal article) can be connected outcomes of teacher research.

Finally, the participants experienced some difficulties with sharing their research findings with colleagues in school. In the final evaluation meeting, they reported that they had the feeling that they were seen as 'external researchers', the lucky ones who were allowed some time to do research. Yet the participants had chosen to study a specific topic, which was already in their mind for some time. While this might have had a positive influence on the engagement of the participants with their research projects, it might also have been too specific to attract colleagues, of whom many taught other school subjects.

Discussion and conclusion

The four participants carried out research projects with which they increased their professionalism, changed their teaching practices, and extended the knowledge base on teaching and learning. With respect to increased professionalism, the participants reported significant changes in the way they taught and how they thought about teaching. They took different perspectives on teaching, looked at alternative solutions for problems, and reflected more deeply on their own teaching as well as teaching of their colleagues. They thought of teacher research as a valuable way to develop and deepen their teaching expertise. With respect to the improved teaching practice, the participants not only carried out research projects which were direct related to their teaching practice, they also used their research findings to design new teaching practices. Finally, addressing the aim of extending the knowledge on teaching and learning appeared to the most challenging, although Kathy, Roger, Ulf, and Howard successfully published their research in scientific journals. With respect to sharing research findings with their colleagues in school, they felt a tension with the school agendas, requiring fast results. Moreover, participants' colleagues in school did not show much interest in the research findings of the participants.

Knowledge generalization in the three research projects summarized in this study actually followed the more traditional way of using a quasi-experimental research design and statistics to generate insights about the underlying principles of the teaching practice that

the teachers examined. But in addition, the results were not abstracted from the context from which they originated and valid qualitative argumentation was to a limited extent used to help others to interpret the results and to support the understanding of what the results could mean for other similar teaching practices. This argumentation was made explicit and exposed to peer review. Given the local nature of many educational research projects – either large-scale quantitative or small-scale qualitative – these elements of situated generalization (Simons et al. 2003) should be part of any research. Hardly any research projects exits in which insights can be generalized to any context on the sole basis of the research design and statistics. Context information – such as the position of the researcher, background of the participants, and context of teaching practices examined – qualitative argumentation, and peer review as the three important elements of situated generalization (Simons et al. 2003) seem to be crucial for any educational research project.

Limitations

Although the findings were framed in the literature on teacher research, this study evaluated teacher research of only four secondary school teachers. We should make it explicit that our findings cannot be generalized to teacher research which is carried out in different contexts. We should know that the teachers in this study were experienced secondary school teachers with a master's degree in their school subject as well as in teaching their school subject. They received a scholarship for professional development and were highly motivated to learn and carry out educational research. Moreover, an apprenticeship model was used, which meant that the teachers examined their classroom guided by a supervisor. This relationship seemed to be crucial to successfully complete and publish the research projects in scientific journals. Finally, the participants reported that they put much effort into combining teaching and doing research. So the conditions for teacher research addressing the three aims of increasing teachers' professionalism, improving teaching practice, and extending the knowledge base on teaching and learning seemed to be optimal. It might be that in less optimal circumstances teacher research is less successful in this respect.

Practical implications

In addition to the practical implication of situated generalization (see Simons et al. 2003) to be applied in any research on educational practice, this study provide some other implications for situating teacher research in educational academic research and practice. First, it should be clear from the start that a research project aims at the three aims of increasing professionalism, improving practice, and extending the knowledge base. The three aims ask for different decisions in the design, implementation, and dissemination of research and some design decisions, such as sampling and data collection methods, cannot be undone. Secondly, teacher research should be relevant for teachers and teaching practice, which means that research on meso-level and macro-level issues in education could better be done by others. In that case, a combination of the tasks of teaching and research is not required *per se*. Thirdly, cross-professional collaboration between teachers and academic researchers can be productive and help to advance both research and practice if these professionals identify with the different perspectives of educational academic research and school practice, reflect

on the different tasks, and transform to a new in-between research practice (cf. Akkerman and Bakker 2011; Schenke 2015):

Concluding remarks

The findings of this study imply that teacher research can be a valuable way to address the three aims of increasing teachers' professionalism, improving teaching practice, and extending the knowledge base on teaching and learning. In this way, theory and practice could be linked by increasing the impact of educational research as well as making teaching practices more evidence-based. This link seems to be essential in order to move beyond practical wisdom as the only basis for good teaching.

Note

1. Pseudonyms are used.

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